Ruminating on Rumination: are Rumination on Anger and Sadness Differentially Related to Aggression and Depressed Mood?

Maya Peled · Marlene M. Moretti

Abstract Rumination is a risk factor for aggression and depression, yet few studies have incorporated both aggression and depression in a unitary model that reflects how rumination predicts these distinct conditions. The current study examined rumination on anger and sadness to assess their unique relations with aggression and depressed mood, respectively. Analogous anger rumination and sadness rumination questionnaires were used to minimize measurement variance, and were completed by 226 undergraduate students. Factor analysis suggested one general rumination factor comprised of two distinct sub-factors of anger rumination and sadness rumination. Path analysis confirmed unique relations between anger rumination and aggression, and sadness rumination and depressed mood. Further, anger rumination and anger were independent predictors of aggression. Results supported the conceptualization of anger rumination and sadness rumination as distinct constructs and underscore the importance of pursuing research that incorporates both forms of rumination to better understand how they impact development, mental health, and behavior.

Keywords Rumination · Anger · Sadness · Aggression · Depressed mood

Rumination refers to conscious, repetitive thoughts that revolve around a common theme, and usually implies cognitions that are intrusive and aversive (Carson and Cupach 2000; Sukhodolsky et al. 2001). The cognitive process of rumination is believed to maintain and intensify negative affect (e.g., Miller et al. 2003), and is thus regarded as a maladaptive affect regulation strategy (Broderick and Korteland 2002).

Rumination has been identified as a risk factor for both aggression (e.g., Bushman et al. 2005) and depression (e.g., Morrow and Nolen-Hoeksema 1990). However, few studies have incorporated both aggression and depression in a cohesive model to understand how the cognitive process of rumination branches into these two different trajectories. A number of models might be considered. A general model of rumination would posit pervasive and nonspecific effects of ruminative processes on negative affect intensification and preservation, and nonspecific effects on behavior. A specificity model of rumination proposes that rumination is comprised of two unique processes of anger rumination and sadness rumination that predict distinct conditions. In addition, one might consider a model that assumes both a higher-level factor of rumination, with two specific first-order factors of anger rumination and sadness rumination.

Sadness rumination has been conceptualized as repetitive thinking that focuses on one's sadness, and attempts at understanding one's affect (Conway et al. 2000). The intense and repetitive negative ideation is not goal directed and does not facilitate the resolution of

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problems (Nolen-Hoeksema 1991). A number of sadness rumination measures have been developed, including the extensively used Ruminative Responses Scale (RRS; Nolen-Hoeksema and Morrow 1991). However, questions have arisen regarding the construct validity of the RRS (e.g., Conway et al. 2000; Treynor et al. 2003). Conway et al. (2000) developed the Rumination on Sadness Scale (RSS) and reported good convergent and discriminant validity, and high internal reliability for this measure. Sadness rumination has a robust association with depression and has been found to intensify and prolong a depressed mood (e.g., Morrow and Nolen-Hoeksema 1990). Women engage in more sadness rumination compared to men (e.g., Cheung et al. 2004), even after controlling for the sex difference in reported sadness (Nolen-Hoeksema and Jackson 2001). Gender role socialization has been implicated in many of the explanations for these sex differences (Wupperman and Neumann 2006).

Although many studies have been conducted on sadness rumination, relatively few have focused on anger rumination. Rumination on anger refers to thinking repeatedly about anger, and contributes to the maintenance and intensification of angry feelings (Caprara 1986; Sukhodolsky et al. 2001). Sukhodolsky et al. (2001) developed the Anger Rumination Scale (ARS) which has yielded good internal consistency, test-retest reliability, and convergent validity (Maxwell et al. 2005; Sukhodolsky et al. 2001). Men and women have been found to engage in comparable overall levels of anger rumination (Maxwell 2004; Rusting and Nolen-Hoeksema 1998; Sukhodolsky et al. 2001), although Maxwell et al. (2005) found an exception in Hong Kong where Chinese men reported engaging in more anger rumination compared to women. Anger rumination has been found to exacerbate angry mood (Bushman 2002; Rusting and Nolen-Hoeksema 1998) and is associated with aggression (Bushman et al. 2005; Collins and Bell 1997; Maxwell 2004). However, more ecologically valid studies conducted outside the laboratory are needed to further explicate the relation between anger rumination and aggression.

An important question is whether rumination on sadness and anger are uniquely related to specific forms of affect and behavior. One study on adults (Gilbert et al. 2005) examined anger rumination and sadness rumination together, although focused only on depression as an outcome variable. Gilbert et al. found that sadness rumination but not anger rumination predicted depression when the two forms of rumination were covaried. However, Gilbert et al. used a measure of anger rumination and a measure of sadness rumination that differed in question content and scales, so that results of specificity may have been confounded by measurement variance. Aside from recent research on high-risk adolescents (Peled and Moretti 2007), no studies to date have examined both sadness rumination and anger rumination in relation to anger and aggression to assess specificity for the two forms of rumination. While the study on adolescents (Peled and Moretti 2007) provided preliminary validation of the specificity of sadness rumination and anger rumination in relation to affective and behavioral correlates, it is not clear that results can be generalized to a non-clinical population and to adults. Further, understanding anger rumination as a cognitive risk factor for aggression could be helpful in developing clinical interventions, akin to therapies targeting the reduction of sadness rumination to treat depression (e.g., mindfulness-based cognitive therapy; Broderick 2005; Ma and Teasdale 2004).

The present study extends past research by examining both forms of rumination using analogous questionnaires that were developed to minimize potential confounds. Using analogous rumination items rules out the possibility that differences in the emotional and behavioral correlates of each type of rumination are due to differences in the form of the items rather than their focus (i.e., sadness vs. anger). Similarly, finding distinct factor loadings for each type of rumination, even though the form of the items is analogous, would be a compelling demonstration of the uniqueness of sadness rumination and anger rumination.

The goal of the current study was to evaluate the multidimensionality of rumination and the degree to which rumination on anger and sadness have unique associations with emotional and behavioral conditions in a non-clinical sample of young adults. We examined the factor structure as well as the specificity of sadness rumination compared to anger rumination in relation to depressive symptoms, anger, overt aggression and relational aggression. Overt aggression is conceptualized as direct behaviors intended to hurt others, including insults, threats and physical abuse. Relational aggression is described as indirect, socially-based behaviors intended to harm others, such as spreading rumors or ostracizing individuals from social groups (Little et al. 2003). There is evidence that females are less likely than males to engage in overt aggression (Underwood 2003) but that starting at a young age girls may be equally or more likely to engage in relational aggression (Ostrov and Keating 2004).

Based on previous research (e.g., Maxwell 2004; Rusting and Nolen-Hoeksema 1998), we hypothesized that anger rumination compared to sadness rumination would be a stronger positive predictor of anger, relational aggression and overt aggression. We also expected anger rumination to predict relational and overt aggression even when anger was controlled, ruling out the possibility that the relation between anger rumination and aggression is merely an artifact of increased levels of anger. Sadness rumination compared to anger rumination was expected to be a stronger positive predictor of depressed mood. With respect to sex differences, women were expected to demonstrate more sadness rumination compared to men, based on previous findings (e.g., Nolen-Hoeksema and Jackson

2001), but sex was not expected to moderate the relation between sadness rumination and depressed mood. We also expected that women and men would report comparable overall levels of anger rumination, given previous North American findings (e.g., Maxwell 2004).

Method

Participants

Participants were 226 undergraduates (155 women, 71 men) ranging in age from 17 to 45 years (M=19.7 years; SD=3.08). They were enrolled in introductory psychology courses at a North American university, and completed the study for course credit. The majority were born in Canada (62%) and spoke English as their native language (58%). Among those whose mother tongue was not English, the majority (71%) reported being very fluent in English, rating themselves as 6 or 7 on a 7-point scale where 1 represented "not at all fluent" and 7 represented "very fluent." None reported marked difficulties with English fluency (i.e., there were no fluency ratings below 4, and only ten participants rated themselves at 4). In terms of ethnicity, 44% identified themselves as Caucasian, 38% as Asian Canadian (e.g., Chinese, Korean, Vietnamese), 10% as South-Asian Canadian (e.g., East Indian, Pakistani), and 8% as another ethnicity (e.g., Hispanic, African-Canadian, mixed). Demographic data were comparable among the younger and older participant groups.

Measures

Sadness and Anger Rumination Inventory (SARI) Existing rumination scales were reviewed to identify key items that could be modified to create two parallel scales for rumination on anger and sadness. Although the wording of some items was modified, their meaning remained the same. Five items from Conway et al.'s (2000) Rumination on Sadness Scale and four items from Sukhodolsky et al.'s (2001) Anger Rumination Scale were included. One *intensification* item from Caprara's (1986) Dissipation-Rumination scale was used ("when I am angry [sad], the more I think about it the angrier [sadder] I feel"), and a new intensification item was created. The final version of the SARI thus consists of 11 items for each type of rumination. Items are analogous, with the words *angry* and *anger* in the anger rumination measure replaced with *sad* and *sadness* in the sadness rumination measure. Participants indicate on a 5-point scale (*never, almost never, sometimes, almost always, always)* how often they 'do the following things' when they are angry (anger rumination questionnaire) or sad (sadness rumination questionnaire)

Form-Function Aggression Measure (FFAM; Little et al. 2003) This questionnaire enables independent examination of the forms of aggressive behavior (overt and relational) and functions of aggression (instrumental and reactive). Little et al. (2003) found strong support for the validity of their measure. The original 36-item measure was reduced to 25 items (12 overt and 13 relational aggression) on the basis of maintaining items with the highest factor loadings (T. Little, personal communication, April 25, 2003). Participants rate on a 4-point scale how true each statement is for them (*not at all*, *somewhat*, *mostly*, *completely*). A sample item tapping overt aggression is "I'm the kind of person who puts others down." A sample item measuring relational aggression is "I'm the kind of person who gossips or spreads rumors." In this study, internal consistency was acceptable for overt (α=.78) and relational aggression (α=.84).

Depressed Mood Eight items were adapted from the depression scales of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2; Butcher et al. 1989). The MMPI-2 depression scales have demonstrated good criterion validity for differentiating between depressed and normative groups (e.g., Bence et al. 1995). In this study, care was taken to select items that were not redundant with ruminative thoughts. A sample item is "I frequently have spells of the blues." Participants were asked to answer *true* or *false* based on how well each statement described them. In this study, a robust weighted least squares exploratory factor analysis (using tetrachoric correlations and varimax/promax rotations) suggested a one-factor solution (eigenvalue greater than 1; root mean square residual [RMR]=.04). The eight items had acceptable internal consistency (α=.81), and were summed to create an overall score for depressed mood.

Anger Anger was assessed with the State-Trait Anger Expression Inventory (STAXI; Spielberger 1996), a widely used self-report measure with sound psychometric properties (Deffenbacher et al. 1996). Robust weighted least squares EFA (using polychoric correlations) indicated that the 10 items from the Trait Anger scale did not load onto a single factor (RMR=.06), which was consistent with results from other studies (e.g., Forgays et al. 1997). Therefore, the four items from the Angry Temperament subscale of the Trait Anger scale were used because results of the EFA using only these items provided strong support for unidimensionality (RMR=.01). These items did not conceptually overlap with anger rumination or aggression. Items pertain to how participants "generally feel" and are rated on a 4-point scale (*almost never, sometimes, often, almost always*). A sample item is "I have a fiery temper." Internal consistency in this study was acceptable (α=.84).

Procedure

The order of questionnaires was randomized for each participant. Further, the sadness and anger rumination scales were never positioned consecutively, and the order of the rumination measures was alternated so that half the participants completed anger rumination before sadness rumination whereas the other half completed them in the reverse order. The study took approximately 35 min to complete. Participants were informed that the study examined relations among thoughts, feelings and behaviors. They provided signed consent prior to completing the study and were debriefed afterwards. This study was submitted for ethical review and received approval at the host university prior to initiation.

Results

Preliminary Analyses

There were only three missing data points due to one participant skipping one item and another participant skipping two items. The participant's mean score on the given scale was assigned to each missing item.

Factor Analysis

Principal axis factoring with direct quartimin oblimin rotation was conducted on all 22 items of the SARI rumination scales (i.e., 11 items from each rumination measure).[1] An item was considered to load onto a factor if its factor loading exceeded .40, and an item was considered to load onto more than one factor if the difference between the factor loadings was less than .10. Three items were dropped (two sadness rumination and one anger rumination) based on these criteria. The scree plot suggested a one-factor solution. However, the RMR for a one-factor solution was .08, whereas the RMR for a two-factor solution was reduced to .06. The RMR for a three- and four- factor solution was .05 and .04, respectively. Examination of the scree plot, eigenvalues, root mean square residuals, residual variances and factor loadings for a one- through four- factor solution supported the retention of two conceptually identifiable sub-factors, accounting for 54.2% of the variance.

Factor loadings and item-total correlations for the two-factor solution (19 items), as well as item means and standard deviations, are presented in Table 1. The anger rumination and sadness rumination items loaded onto two separate factors tapping anger rumination and sadness rumination, respectively. The correlation between the two factors was r=.68. Two composite scores were created by summing the ten anger rumination items (Cronbach's alpha=.91) and nine sadness rumination items (Cronbach's alpha=.92).

Descriptive Information and Zero-order Correlations

Table 2 presents descriptive information on all the variables of interest, including the SARI anger rumination and sadness rumination composite scores. As demonstrated in Table 3, there was a positive correlation between anger rumination and sadness rumination. Each form of rumination (i.e., each composite score) was positively correlated with anger, relational aggression and depressed mood. Anger rumination was correlated with overt aggression, whereas sadness rumination was not.

Sex Differences in Rumination

As illustrated in Table 4, women scored higher than men on sadness rumination, even when controlling for depressed mood, $F(2, 223)=4.40$, $p=.04$. There was no significant difference in anger rumination between women and men also when controlling for anger, $F(2, 223)=.77$, $p=.38$. These findings were consistent with the hypotheses.

Path Analysis

Path analysis using the maximum likelihood procedure (AMOS Version 5.0; Arbuckle 2003) addressed whether anger rumination and sadness rumination are differentially associated with particular emotional and behavioral correlates. Anger rumination was expected to predict anger, overt aggression and relational aggression, whereas sadness rumination was expected to predict depressed mood. The two forms of rumination were specified as correlating with each other. Anger, overt aggression and relational aggression were also specified as correlating with one another.

The model was a good fit to the data, χ^2 (7, N=226)=11.1, $p>.05$; Root mean square error of approximation (RMSEA)=.05 (90% confidence interval=.00−.11); Comparative fit index (CFI)=.99.[2] As illustrated in Fig. 1a, anger rumination predicted anger (β=.33, $p<.001$), overt aggression (β=.21,

[1] The results of factor analysis (FA; pattern matrix) rather than principal components analysis (PCA) were reported because FA is recommended when the goal of the analysis is to detect structure whereas PCA is preferred as a method of data reduction (see Floyd and Widaman 1995). Direct oblimin rotation was performed because this is the standard method for non-orthogonal solutions (i.e., the factors are allowed to be correlated). It is important to note that other methods (e.g., PCA with varimax rotation; maximum likelihood factoring with oblimin rotation) yielded the same factor structure as principal axis factoring with oblimin rotation.

[2] The chi-square value should *not* be significant if there is good model fit. For the RMSEA, Hu and Bentler (2001) have suggested values less than or equal to .06 as the cutoff for good model fit, and .08 as the cutoff for adequate fit. The CFI ranges from 0 to 1, with values closer to 1 indicating better fit.

Table 1 Item means, standard deviations, item-total correlations, and factor loadings from the sadness and anger rumination inventory (SARI)

Item	*M*	*SD*	Item-Total Correlation	Factor Loading[a]	
				1	2
Ang 4. When I think about my anger, I become more upset.	3.12	1.01	.68	**.87**	.17
Ang 2. I have difficulty getting myself to stop thinking about how angry I am.	2.67	.96	.72	**.79**	.03
Ang 11. When I am angry, the more I think about it the angrier I feel.	3.06	1.08	.59	**.70**	.08
Ang 7. When something makes me angry, I turn this matter over and over again in my mind.	2.96	1.05	.76	**.68**	-.13
Ang 9. Whenever I feel angry, I keep thinking about it for a while.	3.08	1.01	.73	**.68**	-.11
Ang 5. I get absorbed in thinking about why I am angry and find it difficult to think about other things.	2.79	1.10	.70	**.65**	-.12
Ang 8. I tire myself out by thinking so much about myself and the reasons for my anger.	2.42	1.13	.71	**.58**	-.24
Ang 10. I think about certain events from the past and they still make me angry.	2.60	.99	.60	**.55**	-.12
Ang 1. I keep thinking about past experiences that have made me angry.	2.67	.95	.62	**.52**	-.18
Ang 3. I keep thinking about the reasons for my anger.	3.11	1.02	.61	**.51**	-.15
Sad 3. I keep thinking about the reasons for my sadness.	3.17	1.00	.68	-.19	**.88**
Sad 5. I get absorbed in thinking about why I am sad and find it difficult to think about other things.	3.05	1.08	.81	.07	**.80**
Sad 7. When something makes me sad, I turn this matter over and over again in my mind.	3.15	1.10	.75	.05	**.76**
Sad 2. I have difficulty getting myself to stop thinking about how sad I am.	2.84	.98	.80	.13	**.73**
Sad 1. I keep thinking about past experiences that have made me sad.	2.94	.97	.72	.03	**.73**
Sad 8. I tire myself out by thinking so much about myself and the reasons for my sadness.	2.61	1.22	.73	.16	**.66**
Sad 9. Whenever I feel sad, I keep thinking about it for a while.	3.42	1.01	.74	.19	**.63**
Sad 4. When I think about my sadness, I become more upset.	3.31	1.05	.63	.30	**.41**
Sad 10. I think about certain events from the past and they still make me sad.	2.97	1.03	.57	.26	**.41**

[a] Absolute values greater than .40 are in boldface.

Table 2 Descriptive information on the variables

Variable	*M*	*SD*	Possible Range	Observed Range	Q1	Q2	Q3	Skew (G_1)	Kurtosis (G_2)
Anger rumination	28.49	7.65	10-50	10–50	24	29	33	-.07	.13
Sadness rumination	27.46	7.37	9-45	10–45	23	28	33	-.19	-.15
Anger	6.47	2.40	4-16	4–15	4	6	8	1.15	1.29
Overt aggression	15.97	3.48	12-48	12–29	13	15	18	1.24	1.39
Relational aggression	19.21	4.83	13-52	13–40	15	18	22	1.20	1.73
Depressed mood	2.23	2.32	0-8	0–8	0	2	3	1.04	.19

N=226; S.E.(Skew)=.16; S.E.(Kurtosis)=.32

Table 3 Zero-order correlations

Variable	1	2	3	4	5	6
1. Anger rumination	–	.74***	.33***	.21**	.33***	.41***
2. Sadness rumination		–	.25***	.04	.22***	.48***
3. Anger			–	.44***	.29***	.18**
4. Overt aggression				–	.42***	.08
5. Relational aggression					–	.18**
6. Depressed mood						–

* $p<.05$, ** $p<.01$, *** $p<.001$.

Table 4 Sex differences (N=226)

Variable	M (SD)		t	η_p^2
	Women	Men		
Age	19.57 (3.11)	19.85 (3.02)	0.61	.00
Anger rumination	28.99 (7.54)	27.41 (7.83)	-1.44	.01
Sadness rumination	28.18 (7.46)	25.87 (6.97)	-2.20*	.02
Anger	6.67 (2.45)	6.03 (2.26)	-1.88	.02
Overt aggression	15.56 (3.15)	16.87 (3.99)	2.67**	.03
Relational aggression	19.04 (4.73)	19.58 (5.04)	0.78	.00
Depressed mood	2.30 (2.29)	2.06 (2.39)	-0.74	.00

*p<.05, **p<.01.

p=.001), and relational aggression (β=.33, p<.001). Sadness rumination predicted depressed mood (β =.47, p<.001).

The model was tested against an alternative, reversed model (Fig. 1b) to verify that the hypothesized model was a better fit. In the reversed model, depressed mood was regressed onto anger rumination, while anger, overt aggression and relational aggression were regressed onto sadness rumination. Results indicated that the reversed model was a poor fit to the data, RMSEA=.16 (90% confidence interval=.12–.20); CFI=.89; χ^2 (7, N=226)=46.8, p<.001. In addition, the Akaike information criterion (AIC) indicated that the reversed model (AIC= 86.8) was a worse fit than the original model (AIC=51.1).

The modification indices from the original model indicated that specifying a relation between sadness rumination and overt aggression would further increase the model fit. Overt aggression was regressed onto sadness rumination (Fig. 1c), and results indicated that sadness rumination was a *negative* predictor of overt aggression (β=-.23, p=.01). Although the original model was a good fit, the revised model was a better fit, producing a significantly lower chi−square statistic, $\Delta\chi^2$= 7.5, 1 *df*, p<.01; RMSEA=0.00 (90% confidence interval= 0.00–.06); CFI=1.0.

Neither the original model ($\Delta\chi^2$=11.1, 7 *df*, p>.05) nor revised model ($\Delta\chi^2$=3.6, 6 *df*, p>.05) were worse predictors than the saturated or "just-identified" model that specifies all possible relations among the variables and fits the data perfectly. Table 5 provides regression information from the saturated model on the relations among each form of rumination (with the other form partialled out) and the outcome variables. Results were consistent using multiple regressions rather than path analysis.[3]

[3] Two highly correlated predictors, such as rumination on anger and sadness, could potentially pose problems associated with collinearity, whereby estimates of individual regression weights would not be reliable. However, the accuracy of the predictions would not be affected. Further, the TOL (.46), VIF (2.20) and Condition Indices (1; 8.6; 13) indicated that collinearity was not a problem in this study. Indicators of collinearity problems would be TOL<.1; VIF>10; and Condition Index >15.

To assess if gender moderated the relations among rumination and the outcome variables, a linear regression was conducted with gender, anger rumination and sadness rumination entered in Step 1, and the interaction terms (anger rumination x gender; sadness rumination x gender) entered in Step 2. Regression results indicated that the interaction terms were not significant in relation to any of the outcome variables (p's>.05).

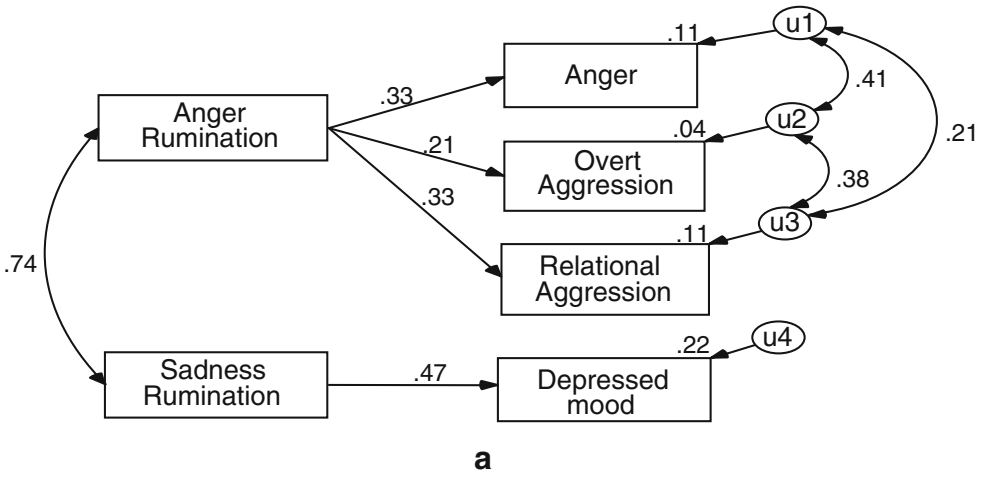
Anger Rumination and Anger in Relation to Aggression

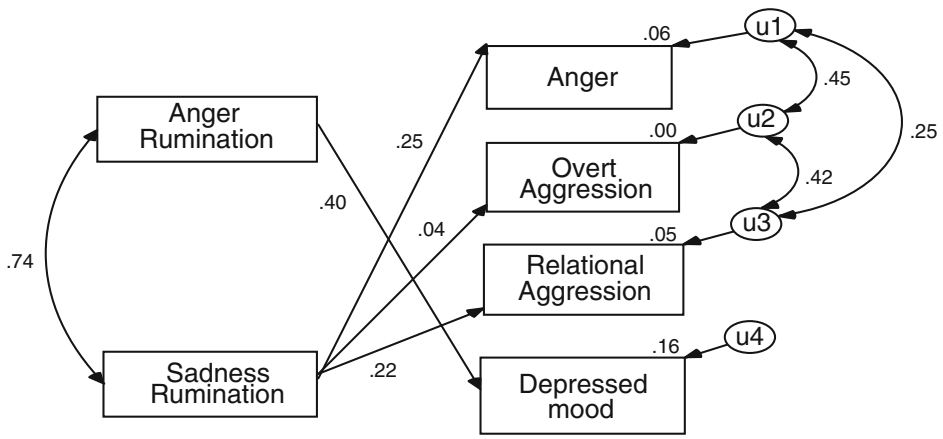
To evaluate whether anger rumination predicted aggression even when anger was controlled, a general linear model (GLM) multivariate regression was conducted with anger rumination, sadness rumination and anger entered as covariates[4] (i.e., predictor variables), and overt aggression and relational aggression entered as dependent variables. The parameter estimates indicated that both anger, t(225)=6.76, p<.001, and anger rumination, t(225)=2.82, p<.01, were independent positive predictors of overt aggression, whereas sadness rumination was a negative predictor, t(225)=−2.82, p<.01. Independent predictors of relational aggression were anger, t(225)=3.15, p<.01, and anger rumination, t(225)= 3.34, p=.001.

Discussion

The goal of this study was to assess whether anger rumination and sadness rumination have distinct emotional and behavioral associations in a non-clinical sample. This research extends previous research on high-risk adolescents (Peled and Moretti 2007), and results were consistent across both samples. In the current study, results of factor analysis suggested the presence of a higher-order, general

[4] For GLM, covariates can be used with dependent variables to define a regression model.





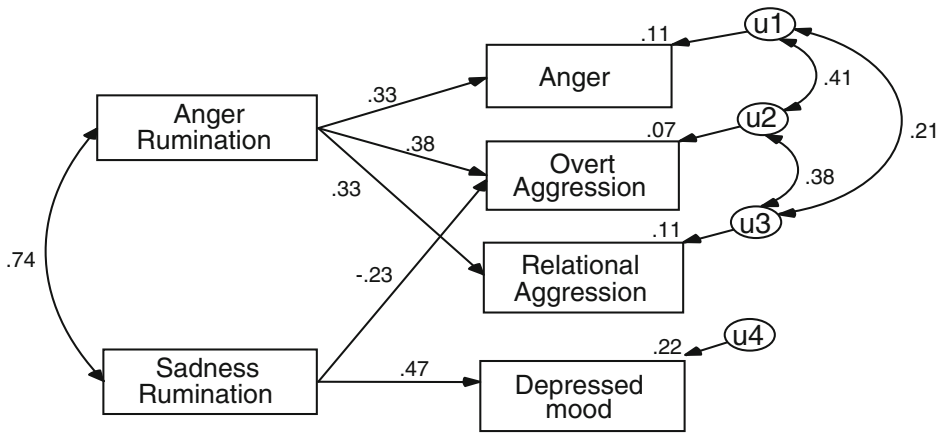


Fig. 1 Path models for (a) original model, RMSEA=.05; (b) reversed model, RMSEA=.16; and (c) revised model, RMSEA=.00

rumination factor that is comprised of two distinct first-order factors of anger rumination and sadness rumination. Individual differences may exist in people's tendencies to ruminate in general, across a variety of affective states and contexts. Individuals who often ruminate on anger may also ruminate often on sadness, which would explain the high correlation between both forms of rumination in this study.

Importantly, however, this study demonstrated specificity of rumination on anger and sadness in that each form of rumination was associated with unique emotional and behavioral correlates. The finding of a general rumination

Table 5 Rumination on anger and sadness as predictors of anger, overt aggression, relational aggression, and depressed mood

Outcome variable	Anger Rumination			Sadness Rumination		
	B	*SE B*	β	*B*	*SE B*	β
Anger	.10	.03	.32***	.00	.03	.01
Overt aggression	.18	.04	.39***	-.12	.05	-.24**
Relational aggression	.24	.06	.38***	-.04	.06	-.06
Depressed mood	.03	.02	.11	.11	.02	.39***

*$p<.05$, **$p\leq.01$, ***$p<.001$.

factor with two specific sub-factors of anger rumination and sadness rumination is akin to the conceptualization of negative affect as a general factor with the emotions of anger and sadness as two distinct forms of negative affect. The uniqueness of sadness and anger is reflected, for example, in variations in sympathetic activation measured by skin conductance (e.g., Christie and Friedman 2004) and increased sympathetic activation when shifting from an angry to sad affective state but not from a sad to angry state (Rochman and Diamond 2008).

Results of the current study indicated that when shared variance was controlled, anger rumination but not sadness rumination positively predicted feelings of anger, relational aggression and overt aggression. Although there was a significant zero-order correlation between sadness rumination and relational aggression, the relation between these variables was not significant when anger rumination was controlled. Findings were consistent with the hypotheses and with previous research demonstrating a link between anger rumination and anger (Bushman 2002; Rusting and Nolen-Hoeksema 1998), and anger rumination and aggression (e.g., Maxwell 2004). The current findings extend previous research by demonstrating the unique relation of anger rumination (i.e., controlling for sadness rumination) with relational and overt aggression in a non-clinical sample.

It is possible that anger is a precursor to anger rumination (Caprara et al. 2007). The spread of activation could occur, however, either through affective or cognitive priming of associations (Higgins 1991). Regardless of which 'comes first,' a bidirectional relation likely exists between anger and anger rumination in that increases in one lead to increases in the other, and both contribute to predicting aggression as demonstrated in the current study. The finding that both the affective experience of anger and the cognitive process of anger rumination independently predicted aggression suggests that both the cognitive component (identifying and exiting rumination cycles) and the affective component (reducing and controlling feelings of anger) should be targeted in interventions.

Ruminating on anger may increase risk for aggression because this form of coping is characterized by turning one's attention inward as opposed to seeking interpersonal support, which has been found to mitigate both feelings of anger and aggressive behavior (e.g., Scarpa and Haden 2006). Turning to others for support may moderate angry feelings, reduce rumination and enhance adaptive emotion and behavior regulation, thereby reducing aggressive behavior. Interventions that assist in reducing individuals' tendency to ruminate and simultaneously support their appropriate expression of distress and anger toward others may prove effective in reducing problems with anger and aggression.

Results also confirmed that sadness rumination but not anger rumination predicted depressed mood when the two forms of rumination were covaried. These findings replicate previous research (Gilbert et al. 2005) and extend the field by demonstrating the specificity of sadness rumination to depressed mood even when analogous rumination measures are used. Further, sadness rumination emerged as a *negative* predictor of overt aggression, suggesting that the tendency to ruminate on sadness might inhibit aggressive behavior toward others. This result is consistent with the notion that sadness rumination decreases the risk for externalizing disorders, including aggression, because it involves passive rather than action-oriented thinking (Nolen-Hoeksema 1998), and a negative focus on the self (e.g., self-criticism and self-blame) as opposed to a negative focus on others that is linked to aggression and retaliation (Vansteelandt and Van Mechelen 2006).

Results of this study appear consistent with those of May and Jones (2007) who investigated two forms of hurt that are correlated, yet predict unique response trajectories. Introjective hurt is associated with an internalizing pattern including feeling sad and engaging in self-blame and self-criticism, which seems similar to sadness rumination. In contrast, retaliatory hurt is linked to an externalizing pattern including feeling angry toward others, blaming, and confronting others, which seems similar to anger rumination.

Anger rumination and sadness rumination may predict unique response trajectories because they correspond to separate associative networks that activate different

thoughts, feelings, physiological responses and motor reactions (Miller et al. 2003). These conceptually independent associative networks for rumination on anger and sadness may be the mechanisms through which the content-specific effects of both forms of rumination arise.

The Sadness and Anger Rumination Inventory (SARI) was explicitly designed to contain analogous scales for each form of rumination to ensure that results of specificity were not due to different question content and format. A potential limitation with this approach is that unique characteristics of each form of rumination might not have been fully captured. For example, a feature of anger rumination—"thoughts of revenge"—was not included in the anger rumination questionnaire because analogous items could not be devised for the sadness rumination questionnaire. Although developing the SARI (congruent measures for both types of rumination) was an important first step to examine both types of rumination using a methodology that minimized measurement variance, it is not the final step in understanding the constructs of anger rumination and sadness rumination. It may be that content differences in the two forms of rumination, which were attenuated using the SARI, are what maximize the prediction of anger, aggression and depressed mood. Therefore, focusing on these differences, by using measures that include unique content for each form of rumination, may have important implications for future research and intervention. It will be important for future studies to investigate how the SARI fares in comparison to other rumination measures in predicting specific conditions.

In addition, it will be important for future rumination research to be conducted on non-clinical groups of adults that extend beyond the university setting, and across a wider age range, to assess the generalizability of findings. Research examining adult clinical populations and adopting longitudinal designs will also shed more light on the distinction between the two forms of rumination, and the predictive role of rumination in the course of aggressive behavior. Further, it is important to recognize that this study investigated the relation between rumination and depressed mood, rather than depression. In addition, a shortened measure was used to assess depressed mood (items from the MMPI) as opposed to a lengthier measure assessing clinical depression (e.g., Beck Depression Inventory; BDI). Replication of our findings is necessary within adult clinical populations using a standard instrument such as the BDI to measure clinical depression.

As predicted, and consistent with previous research (Nolen-Hoeksema and Jackson 2001), women reported higher levels of sadness rumination compared to men, even though sex did not moderate the relation between sadness rumination and depressed mood. Results also supported the prediction that women and men would engage in comparable overall levels of anger rumination. These findings replicate our earlier study in a clinical sample of adolescents. However, in the current study, females outnumbered males and the male sample was relatively small. Therefore, there was limited sensitivity in detecting sex differences. Continued examination of sex differences in the relations among anger rumination and sadness rumination to aggression and depressed mood is important, particularly in light of the growing recognition of aggression in women and the lack of research on sex differences in risk factors related to these outcomes (e.g., Moretti et al. 2004).

It is important to point out that this study relied only on self-report measures and future research using alternative assessment modalities, such as a diary measure to assess rumination, will be important to supplement these findings. A diary methodology (e.g., Siemer 2005; Whalen et al. 2006) would enable investigation of both the intensity and frequency of people's ruminative thoughts and could shed light on the interplay between the two forms of rumination. This type of methodology could also address whether both forms of rumination, which were highly correlated in this study, are typically experienced concurrently or separately in different contexts, or the extent to which one type of rumination temporally precedes the other.

In sum, our findings suggest that rumination can take different forms with distinct affective and behavioral consequences. Thus, research on rumination should routinely distinguish between types of rumination, and measure distinct associations for each. Doing so will provide greater insight into the antecedents and correlates of specific forms of rumination, and their effects on development, mental health, and aggression throughout the lifespan.

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